THE ENGINEER.

The British Industries Fair at Birmingham.

The British Industries Fair, Birmingham.

An exhibition is something of an event to engineers. Among the stands they can observe the progress of their profession, trade, or craft according to their status, and study machinery, mechanical and other devices, and the improvements in materials and design. But there is more in an exhibition than the impersonal "thing." The grounds of the exhibition form a meeting place for those who cannot spare the time, or incur the expense of travelling. To such a Fair as that now being held in Birmingham visitors come from all over the world, and we, in this country, have an opportunity, not only to demonstrate to them what we can produce, but also to offer them every hospitality within our power.

J. H. Holmes and Co., Ltd.

The associated firms of A. Reyrolle and Co., Ltd., and J. H. Holmes and Co., Ltd., are showing their goods on the same stand. The J. H. Holmes exhibits consist among other things of motors for many different purposes. Amongst A.C. machines there are two induction motors for general use, a flame-proof motor, a totally enclosed fan-cooled motor, a variable speed commutator motor, and a conveyor motor. There is also a direct-current machine. The totally enclosed fan-cooled motor is built on the twin-case principle, with an annular space between the inner and outer cases, through which cooling air is driven by a fan mounted on the end of the driving shaft. The flame-proof motor has a strongly ribbed frame, with wide metal-to-metal flanges which effectively prevent the passage of flame. As shown

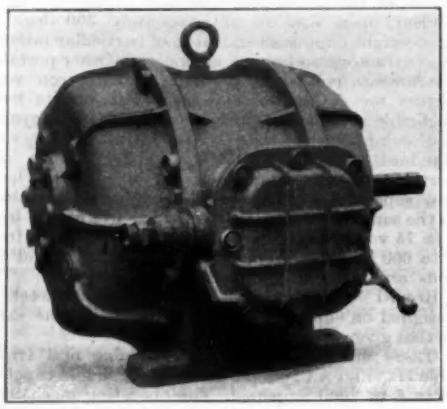


Fig. 1—Flame-proof Motor—Holmes

in the illustration, Fig. 1, a flame-proof starting switch is fitted to the motor and its enclosing case forms part of the motor. The commutator motor, which has series characteristics, is one of a number of these motors designed to give efficient speed control. Speed regulation is obtained by moving the brushes, which are shifted by a hand wheel, or, if desired, they can be remotely controlled by means of a small brush-shifting motor. These A.C. motors, which are also supplied with shunt characteristics, are suitable for many kinds of service, such as driving fans, pumps, turntables, winches, &c., and can be designed in some cases for speed ranges as high as 12½ to 1. The conveyor motor has been designed for use at the coal face and has a plain cylindrical exterior, so that it can be rolled along the roadway with small effort, and it is provided with a special cage for supporting it when in use. The direct-current machine is one of the firm's standard motors.

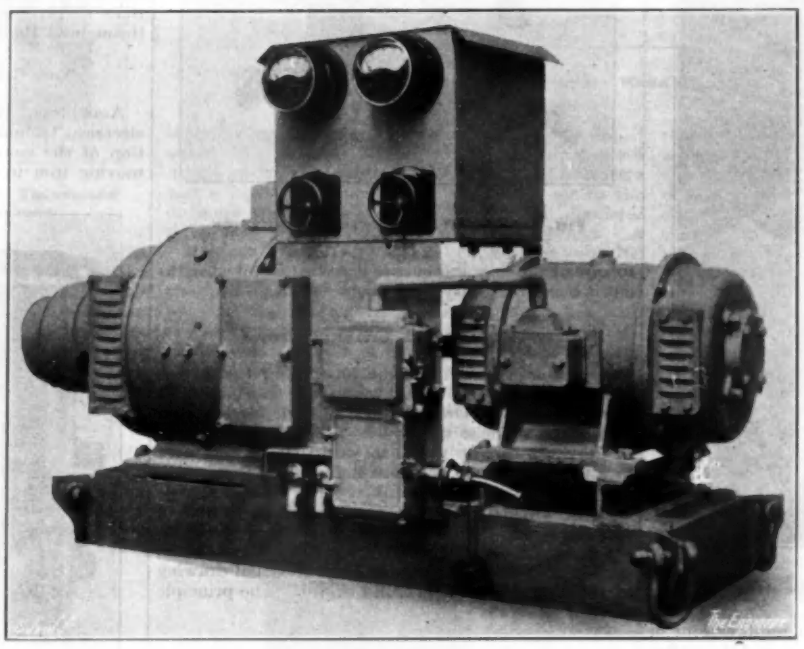


Fig. 2—Arc Welding Set—Holmes

Besides these motors "Castle" arc welding equipment, consisting of a generator which may be coupled to an A.C. or D.C. motor, or a petrol engine, is shown. The whole equipment—see Fig. 2—is mounted on a rigid fabricated bed-plate, which can be supported on wheels. The control gear and resistances are fitted above the generator, and are arranged so that good ventilation is provided at all times. The set illustrated is a single-operator unit, and is suitable for working from a 400-volt, three-phase, 50-cycle supply. A Holmes' unit type air-break, metal-clad switchboard, designed for floor or wall mounting, is exhibited. These switchboards are made for currents ranging from 30 to 350 ampères at 660 volts, and include bus-bar chambers, fuse boxes, switches, circuit breakers, and cable-sealing and dividing boxes for armoured cables. The particular switchboard that is exhibited is arranged for floor mounting, and has one incoming 200-ampère circuit and four outgoing circuits, two of 30 ampères capacity and two of 60 ampères capacity. Instrument exhibits consist of 8in. dial moving iron ammeters and voltmeters, and a flame-proof sector type ammeter. There is also a switchboard suitable for controlling a private generating plant with batteries.

Williams and James.

So many things are nowadays driven by compressed air that a very large range of air compressing plant is required to meet the various demands. Williams and James, of Chequers Bridge, Gloucester, specialise particularly in the smaller classes of such machines, and are showing on the stand they have taken at the Exhibition compressors suitable for paint spraying, tire inflation, mist washing, air bottle charging, and for the operation of pneumatic tools. The machine we have chosen for illustration in Fig. 3 belongs rather to the latter class. It is driven by belting and is equipped with an epicyclic "clutch" which automatically disconnects the compressor crank-shaft from the belt pulley when the pressure in the receiver has attained a certain predetermined level. Usually the "clutch" is designed to "come out" at a receiver pressure of 150 lb. per square inch and "cut in" again when that pressure falls to 120 lb. per square inch. The "clutch" consists of an ordinary epicyclic train around the outer wheel of which there is a brake band. When the brake is in action the outer wheel of the epicyclic train is held and consequently the compressor is driven, while when the brake is slacked off the outer wheel is allowed to revolve and consequently there is no drive. Normally the brake band is held tightly round the brake drum by a spring, but when the receiver pressure rises above the predetermined level air passing by a relay governor control to a brake-operating cylinder overcomes the resistance of the spring and releases the brake band. An air release valve is fitted in case any accident should occur to the governor. Usually the epicyclic gear is so arranged that the compressor runs at the same speed as the belt pulley, but, if necessary, it can be designed to give other ratios. The gears are housed in an oil-tight drum which runs on light roller bearings. The driving and driven wheels fit on splines on their respective shafts and the planet wheels run on double roller bearings which are lubricated by splash from the oil in the brake drum. The whole drum is carefully balanced. This compressor with a stroke and bore of 2in. by 2in., when running at 1000 r.p.m., has a displacement of 3·64 cubic feet per minute and requires about

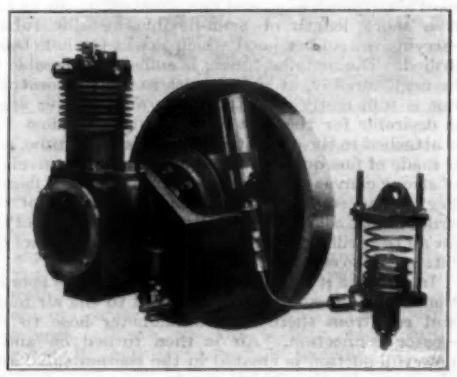


Fig. 3—Belt-Driven Compressor—Williams and James

1 B.H.P. at the driving shaft to deliver against 150 lb. per square inch.

Another machine exhibited on the stand is suitable for fruit spraying, for which purpose lightness and portability are of great importance. The pump—of the semi-rotary variety—is driven by a 2 H.P. hopper-cooled petrol engine and the outfit is mounted

upon a light hand trolley, the whole affair weighing no more than 3 cwt. The pump will deliver 220 gallons per hour against a pressure of between 300 lb. and 350 lb. per square inch, using liquid dopes or arsenate of lead. An adjustment is provided in the guns so that for small trees and shrubs the delivery may be in the form of a mist, while for larger trees the jet can be enlarged to give a wider range. The pump housing, barrels and plungers are made of bronze and the whole pump is totally enclosed. When the gun is shut off the liquid is returned to the tank through a relief valve.

HARDYPICK, LTD.

There is a variety of mining appliances and tools on the stand of Hardypick, Ltd., of Sheffield, out of which we have chosen two items to illustrate in Figs. 4 and 5. The firm's rock drills, air compressors, drill sharpening machines, and so on are sufficiently familiar to our readers to need no further mention, but the "Hay Device" shown in Fig. 4 is more novel. This apparatus has been devised by Mr. P. S. Hay, of the Safety in Mines Research Board, to provide a simple and efficient means of collecting the injurious dust produced by dry drilling in rocks containing a considerable percentage of silica. It is claimed that this apparatus reduces the risk of miners' phthisis to an absolute minimum, and as it weighs less than 30 lb., can be readily moved from

FIG. 4—"HAY" DUST COLLECTOR—HARDYPICK

hole to hole as drilling proceeds. It requires four or five minutes to assemble the appliance, and thereafter it can be moved from hole to hole in about half a minute.

There are three main parts in the apparatus: a telescopic spring-pressed light steel stretcher bar, adjustable to suit any height from 5ft. to 9ft., which is fitted with a cross bracket to hold the suction tube. There is also a steel suction tube fitted internally with an ejector of the Venturi type and a rubber suction hood through which the drill steel is put, not exceeding 2in. in diameter. The suction tube is of light weldless steel about 30in. long, and has attached to one end of it a short length of semi-flexible metallic tubing carrying the rubber hood which masks the hole being drilled. The metallic tubing is sufficiently flexible to be bent, forcibly, at right angles to the suction tube, but is sufficiently rigid to remain at whatever angle is desirable for the hole being drilled. A dust bag is attached to the opposite end of the suction tube, and is made of fine quality flannel enclosed in an envelope of strong canvas of special design to relieve the flannel bag of the strain of supporting the weight of the drilling dust collected. The dust bag filters out of the air all the drilling dust, and, of course, then allows the filtered air to escape.

In practice it is only necessary to fit a tee connection where the air drill is connected to the air main, and run from there a small-diameter hose to the ejector connection. Air is then turned on and a powerful suction is created in the suction tube, and, of course, in the rubber mask over the hole being drilled. This powerful induced draught gets hold of all the fine drilling dust and passes it along to the filter bag. Tests carried out in this country have proved that with the device in action the dust content of the atmosphere in the vicinity of drilling operations can be reduced well below the maximum permitted by the Miners' Phthisis Prevention Committee of the South African Government.

The construction of the wire rope cutter—Fig. 5—is fairly obvious. It is made of steel castings and has a cutter in the jaws at the front which is operated by the ratchet quadrant and lever shown. There is a double ratchet to avoid lost motion. The rope, it will be seen, is well supported by the jaws of the cutter, so that it is not flattened or deformed in the process, and the cut can be made quite close up to the seizing. It is obvious that such a machine is far more satisfactory than a hand hacksaw for cutting wire ropes, and it only weighs 112 lb. It will cut wire ropes up to 1¼in. in diameter or chains up to 1in. in diameter. When it is used for cutting chains the operation is continued after one side of the link has been severed

FIG. 5—WIRE ROPE CUTTER—HARDYPICK

to spread the link and enable it to be unhooked without it being necessary to cut both sides.

GRESHAM AND CRAVEN, LTD.

A new injector with some interesting features is to be seen on the stand taken by Gresham and Craven, Ltd., of Ordsall-lane, Salford, Manchester. It is claimed for it that by its use the smaller sizes of injectors can be made to work with feed water at a temperature 30 per cent. higher than that which has previously been possible. For instance, the injector will handle feed water at a temperature of 145 deg. Fah. against a boiler pressure of 150 lb. per square inch, or at 125 deg. Fah. against 275 lb. per square inch boiler pressure. A sectional drawing of the new injector is given in Fig. 6. The principle

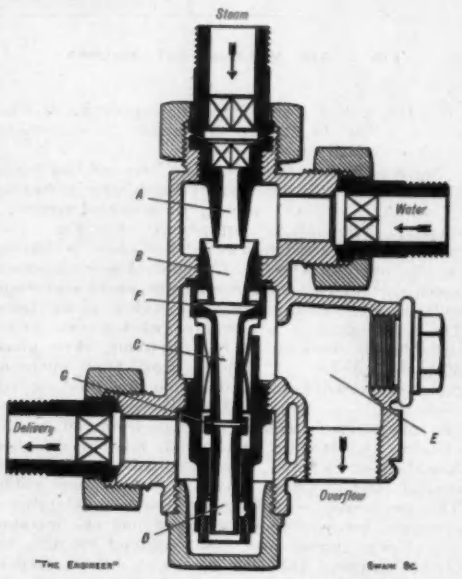


FIG. 6—FEED WATER INJECTOR—GRESHAM

of the invention lies in the provision of a special form of sliding delivery cone, which moves forward when the injector is first put into operation and subsequently is forced back on to its seat on the combining cone when the injector is working. Since in this way the atmosphere is prevented from coming into contact with the jet at any point during its passage through the cones the injector will work with high feed temperatures.

Referring to the drawing, Fig. 6, it will be seen that the steam enters the steam cone A. It passes through the lifting cone B, forcing the combining cone C and delivery cone D forward and escapes through the overflow passage E *vid* the gaps produced at F, between the lifting and combining cone, and G, between the combining cone and delivery cone by the movement of the sliding cones. The free passage of the steam at high velocity through the lifting cone causes the water to enter the latter. Here it comes in contact with the steam and condenses it, and by this means the combined jet attains sufficient velocity to pass through the cones and enter the boiler. When it does so, a counter pressure is exerted on the forward end of the delivery cone, and this pressure is sufficient to force the combining cone back on to its seat on the lifting cone and the delivery cone on to its seat on the combining cone, thus closing the overflow gaps at F and G. In this way the jet is totally enclosed in the cones whilst working, and is, therefore, not subject to atmospheric effects. For this reason, it will deal with feed water at higher temperatures than will the type of injector which has a portion of the moving jet of water exposed at some point to the effects of the atmosphere. Should any temporary interruption in the supply of water or steam occur causing the injector to "knock off," the combining and delivery cones will move forward as the pressure in the delivery pipe falls, and come back automatically to their respective working positions as soon as normal conditions in the water and steam supply are reinstated.

Besides the new injector Gresham and Craven, Ltd., are showing the system of feed water heating which we described and illustrated fully in a Supplement to our issue of February 14th, 1930, and a steam hot water circulation system particularly applicable to glass-houses, for which it is claimed that it gives a very even distribution of heat throughout the whole house.

THE RECORD ELECTRICAL COMPANY.

Ammeters, voltmeters, insulation-testing sets, electrical tachometers, circuit breakers, and a collection of the company's "Cirscale" moving coil and moving iron instruments for direct and alternating

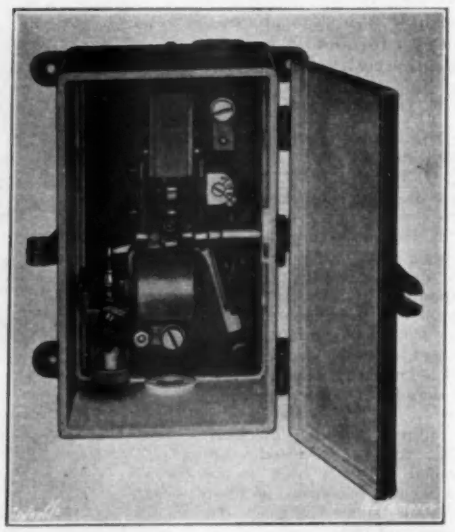


FIG. 7—A.C. CIRCUIT-BREAKER—RECORD

current circuits are shown by the Record Electrical Company, Ltd., of Broadheath, Altrincham, Cheshire. A special feature of the "Cirscale" instruments is a clear, open scale of approximately 300 deg. A light-weight ohmmeter shown is of particular interest to contractors and mains engineers. Other portable instruments consist of precision moving iron voltmeters for A.C. testing. These instruments have negligible frequency errors up to 1000 cycles, and comply with the B.S. specification for substandard capacity. The "Record" change coil portable testing sets which are also shown have two separate moving iron movements combined in the same case. The voltmeter has five ranges from 1 to 75 volts, whilst the ammeter has six ranges from 1 to 600 ampères. The set is self-contained and the coils are housed in a receptacle in the case. The "Record" multi-range change coil ammeter is designed on similar lines, the range being the same as that given above.

There are also some single, double and triple-pole D.C. and A.C. circuit breakers ranging in capacity from 5 to 2000 ampères. The operating mechanism consists of a simple toggle motion, operated by a catch and roller, and there is a loose handle device to prevent the breaker being closed or held closed on an overload. The brush is self-aligning in all directions and can easily be removed for replacement. The breakers can be supplied for switchboard mounting or can be enclosed in welded sheet metal cases for general industrial purposes, as shown in Fig. 7. No-volt or shunt trip devices and time lags are separate attachments, which can be added at any time. The firm is also showing its electrical tachometers, which were described in our columns on the occasion of the

last Shipping, Engineering and Machinery Exhibition held at Olympia.

WESTINGHOUSE BRAKE AND SAXBY SIGNAL COMPANY, LTD.

Metal rectifiers for battery charging, the excitation of magnetic clutches, &c., are exhibited by the Westinghouse Brake and Saxby Signal Company, of 82, York-road, London, N. 1. Applications of these rectifiers were described in an article appearing in our issue of September 4th of last year, but in addition to rectifiers used for the purposes mentioned in that article the firm is showing telegraph and telephone apparatus operated with these rectifiers, as, for

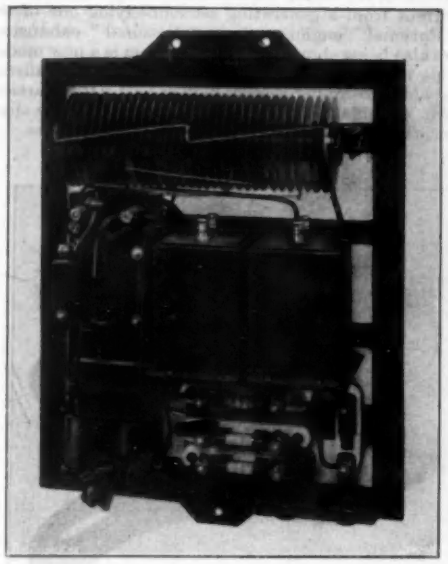


FIG. 8—RECTIFIER FOR PRIVATE TELEPHONE INSTALLATION—WESTINGHOUSE

example, the Creed teleprinter machine, shown in Fig. 9. The rectifier is designed to give an output of 0·75 ampère at 110 volts and operates both the motor of the teleprinter and the telegraph circuits, which are smoothed by a condenser apart from the rectifier set. A centre tapping on the transformer gives half the normal voltage for telegraphic purposes. This class of rectifier has been supplied to the Post Office in large quantities. Another rectifier exhibited is that shown in Fig. 8, which is specially designed to operate a complete private automatic telephone installation from an A.C. supply without the use of batteries. The particular set shown gives an output of 1·5 ampère at 36 volts and incorporates a full smoothing equipment. The output and regulating

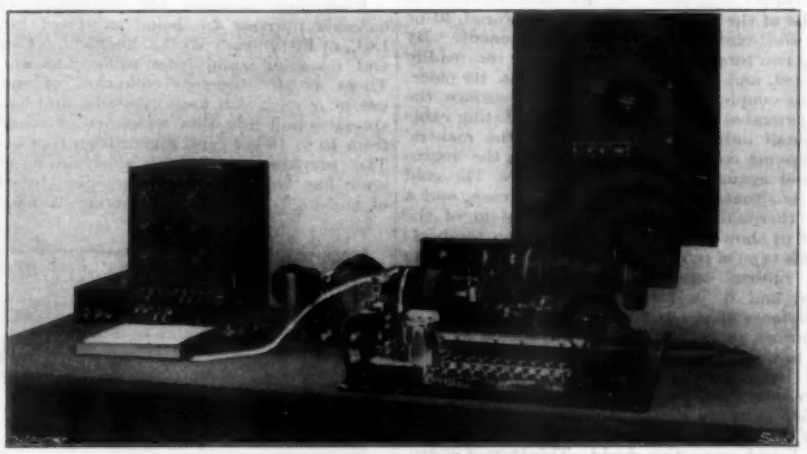


FIG. 9—RECTIFIER OPERATING CREED TELEPRINTER MACHINE—WESTINGHOUSE

characteristics of the set allow accurate selector stepping with three or four simultaneous operations and permit several conversations to be carried on at the same time. Sets of this type are operated on open circuit for considerable periods and do not appear to suffer any ill effects. Other sets of this type with different outputs have been supplied and are said to be operating entirely satisfactorily. The illustration Fig. 8 shows the set with its expanded metal case removed.

EDWARD G. HERBERT, LTD.

In addition to a variety of small tools—such as machine vices, adjustable angle plates, cramps, key extractors and adjustable packings—Edward G. Herbert, Ltd., of Chapel-street, Levenshulme, Manchester, are exhibiting the well-known Herbert "Pendulum" hardness tester and an extensive range of different patterns of hacksaw blades. Among the hacksaw blades the pattern known as the "Rapidor" deserves particular attention. Like most of the other blades made by the firm it is fabricated from 18 per cent. tungsten high-speed steel. That steel is expensive, costing 2s. or 3s. per pound, and therefore to justify its use for hacksaw blades it is essential that improved provision should be made for re-sharpening the teeth. In an ordinary hacksaw blade the teeth are bent over alternately to left and right. As a consequence, after they have been re-sharpened, to a very limited extent, the set of the teeth disappears. It is hardly economical to re-cut and re-set the teeth, for in order to perform the re-setting, the blade would have first to be softened and then heat-treated. The Herbert "Rapidor" blades are provided with Evans' patented set, as shown in Fig. 10. The set, it will be gathered, is not formed by bending the original teeth to one side or the other, but by corrugating the edge of the blade. The corrugations extend into the body of the blade well beyond the depth of the original teeth. As shown on the right of our engraving the teeth can be re-sharpened as

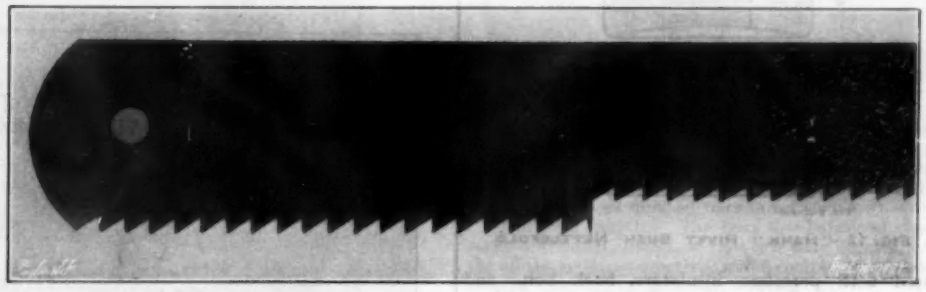


FIG. 10—"RAPIDOR" HACKSAW BLADE—HERBERT

often as twenty times, resulting in the removal of about ¼in. from the blade width, without the set disappearing. We are informed that in a comparative test a high-speed steel blade with teeth set in the ordinary way cut 150 blanks from a 3in. diameter mild steel bar without being re-sharpened. A "Rapidor" blade with Evans' patented set cut 700 blanks from the same size and class of bar, and in the process was re-sharpened twenty times. The average time taken per cut was half that taken with the ordinary form of blade. On this basis it is estimated that the cost of cutting 700 blanks with the "Rapidor" blade would be £2 8s. 6d. using one blade and re-sharpening it twenty times, and that to cut the same number with ordinary blades, twenty of which would be required for the purpose, the cost would be £4 16s. 2d. In addition to the saving of cost there would, it is claimed, be a saving of time, the blanks being cut in thirty-nine hours with the "Rapidor" blade, and in eighty-one hours with the ordinary blades. In this calculation the cost of the "Rapidor" blade is taken at 2s. 11d. and of the twenty ordinary blades at 8s. 5d. The cost of sharpening the "Rapidor" blade is taken at 2d. a time. Wages of the hacksaw attendant are taken at 1s. an hour and the charge for running the 1 horse-power hacksaw motor at 1d. per hour.

THE BRITISH THOMSON-HOUSTON COMPANY, LTD.

Several interesting scientific devices are in operation on the Mazda lamp stand of the British Thomson-Houston Company. Two of them are operated by standard B.T.H. photo-electric relays, whilst another is controlled by a thyratron. The well-known experiment of causing an electric lamp to light by holding a lighted match near the bulb is shown, the apparatus used being an ordinary incandescent lamp placed near a photo-electric relay unit. The light from the match falls on to a photo-electric cell, which operates in the grid circuit of a thermionic valve. Light falling on the cell produces a photo-electric current which is amplified by the valve to a value sufficient to operate a relay, which in turn energises a small contactor, with its contacts in the lamp circuit. Since the light rays of the lamp fall upon the photo-electric cell, the lamp continues to burn until it is removed away from the cell.

Another interesting device in which a photo-electric cell is used is an invisible ray burglar alarm, which operates when a beam of invisible rays is interrupted. The rays, which are obtained from a small electric lamp shielded by a filter, impinge on a photo-electric cell, which is also in a thermionic valve amplifier circuit, the essential difference between the circuit used in this case and that associated with the first-mentioned experiment being in the arrangement of the relay and contactor connections. The contactor in the case of the burglar alarm is energised to operate an electric bell and lamp when the invisible rays are cut off from the cell. The circuit can be arranged so that a warning is only given when the beam is cut off, or so that once the beam has been interrupted a continuous alarm is given until the apparatus is reset. The thyratron demonstration corresponds with that given at the recent Physical and Optical Societies' Exhibition, and referred to in our issue of January 22nd. Briefly, the thyratron, which is a hot cathode mercury vapour valve with "grid" control, is arranged so that an alteration of the value of the capacity associated with the grid of the thyratron alters the grid voltage and allows an arc to pass through the thyratron. The arc current is made to operate a contactor controlling a spot flood-light, and the great sensitivity of the thyratron is shown by the fact that it is sufficient to bring one's hand near a concealed metal plate to alter the capacity sufficiently to switch on the spot light.

THE DOMINION MACHINERY COMPANY, LTD.

The Dominion Machinery Company, of Hipperholme, near Halifax, England, has a stand occupied by a number of wood-working machines, many of which are familiar to our readers.

There is shown the Super Elliot woodworker, which is capable of doing such diverse jobs as ripping, cross-cutting, surfacing and thicknessing, rebating,

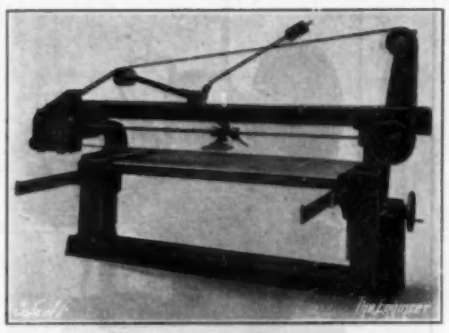


FIG. 11—OVERHEAD SANDER—DOMINION

chamfering, stop-chamfering, mitering, boring and tenoning, without any extraneous services. It is also noteworthy on account of the fact that the timber is always passed through in one direction, so that the machine can be placed quite close up against a wall, and not be stationed out in the middle of a shop, as is sometimes the case with general purpose machines. There are also a 30in. band saw, a heavy-duty, high-speed, spindle moulding machine, in which the upper part of the spindle can be changed from the French style to that of the ordinary collar type, which runs in ball bearings; a hollow chisel and chain mortising machine, that has an unusually effective guide for the chain carrier; some saw benches, and some sanding machines.

Among the most recent of the latter class produced by the company is that illustrated in Fig. 11. It is, it will be seen, of the overhead type, and will handle any length of timber up to 4ft. wide, the swan-necks at each end pillar being 2ft. back from the pulleys. The sanding belt is 25ft. 6in. long, the table is 7ft. 4in. by 3ft., and an end table is fitted in an

upright position for doing end grain work, or small sanding, whilst curved work can be done on the sanding pulley. The table has a rise and fall adjustment controlled by worm gears and square-cut screws inside the two columns, and the weight is carried on ball-bearing washers.

GUEST, KEEN AND NETTLEFOLDS, LTD.

The name of Nettlefolds is usually associated principally with wood screws, but that this Birmingham firm produces a number of other small mass products is evidenced on its stand at the Fair. The list of exhibits includes: Porcelain enamelled screw hooks, scissors, button hooks, cork screws, tin openers, tinned "S" hooks, tinned skewers, bottle openers, wire screwdrivers, "Eclipse" screwdrivers, "4 bit" screwdrivers, ratchet braces, gas head rivets, hooks

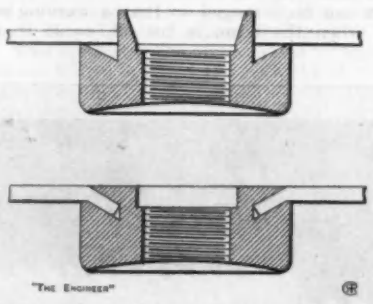


FIG. 12—"HANK" RIVET BUSH—NETTLEFOLD

fitted with porcelain insulators, hook bolts and nuts, drive screws, conical washers, curved washers galvanised straining eyes with wire or malleable cages, wing bolts with cellulose finished heads, cricket and sporting shoe spikes, wire netting fasteners and pliers, and "Hank" rivet bushes.

Among these devices the last-mentioned item is the most novel, and is likely to appeal to engineers for a variety of purposes. It is intended to provide a means of screwing fixtures on to metal plates which are so thin that they will not take a thread, and its use is so plainly shown in the two sketches of Fig. 12 that it is hardly necessary to give it any description. A hole is drilled in the plate, the bush inserted and the shank riveted over with a hammer, so that the edge of the plate round the hole is bent over and the bush is held as if by a dovetail. There are slight indentations in the shoulder to prevent the bush from turning, and provision is made, both top and bottom, to prevent the screw thread being damaged during the riveting operation. The merit of such a device, as compared with a loose nut needs no emphasis.

CHARLES WINN AND CO., LTD.

Those interested in screws and the making of screws should certainly pay a visit to the exhibits of Charles Winn and Co., Ltd., of Granville-street,

FIG. 13—SCREWING MACHINE—WINN

Birmingham. Here there are to be seen a host of screwing machines of various sizes and types, together with cutting-off machines, stocks, dies, tube cutters, and hand-screwing machines of all kinds. We have not the space to illustrate in any sense fully the number of interesting things on the stand, but the engraving Fig. 13 shows a small electrically driven screwing machine capable of dealing with tubes from ¼in. up to 1in. in diameter, or bolts of the same sizes. The machine is coupled up on the stand and demonstrations are made upon it. It is equipped with bow-lever, non-stop hand releases, working in gun-metal slippers, one on each side of the sliding head, for opening and closing the dies while the machine is running. The machine is mounted on a cabinet stand, and there is an extension to the base to carry an electric driving motor. The power is transmitted from the motor by a silent chain drive housed in the cabinet stand, followed by machine-cut spur gearing giving two speeds. The motor is of 1½ H.P. A gear pump is fitted which, with a suitable reservoir and fittings, gives automatic lubrication to all parts requiring it. The vice is of the open-jaw, duplex grip type, having a square thread screw of large diameter.

THE FOSTER INSTRUMENT COMPANY, LTD.

An extensive display of electrical instruments for the measurement and control of temperatures is to be seen

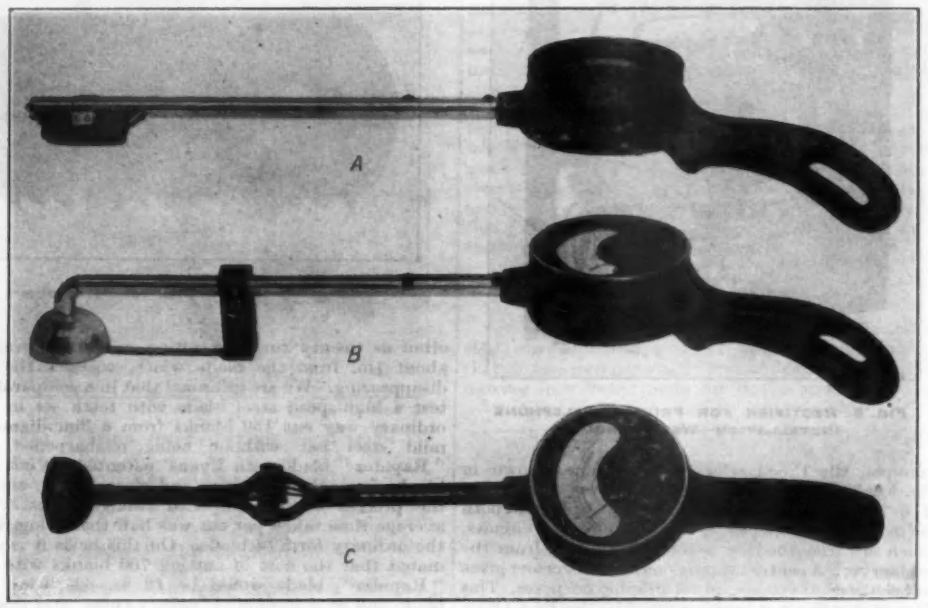


FIG. 14—SURFACE PYROMETERS—FOSTER

on the stand of the Foster Instrument Company, of Letchworth. Perhaps the most interesting exhibits are the firm's surface or contact pyrometers, which are made in three types, as shown at A, B, and C, in Fig. 14. The first comprises a thermo-couple composed of strips of copper and alloy, the hot junction being in the middle of the bridge of insulating material, to be seen on the extreme left of the instrument. By removing two terminal screws the couple can readily be removed, and a new couple be put in its place. When the couple is applied to a hot surface the current generated is carried by a compensating cable to the small indicator, provided with the makers' Resilia moving coil system, which makes the instrument proof against vibration and shocks. The cold junction is situated inside the indicator case, and a mercury thermometer is fitted in the stem of the indicator to show the actual cold junction temperature. This type of pyrometer is used on hot revolving rolls of rubber calenders, on paper and textile machines, and it is also suitable for use on the lagged surfaces of steam pipes, &c.

The surface or contact pyrometer shown at B in Fig. 14 has a fixed convection shield and another type of thermocouple is employed, consisting of alloy wires of dissimilar metals terminating in a copper disc, which is spring loaded to ensure perfect contact with the hot surface. It is also surrounded by a highly polished convection shield. This type of instrument is suitable for use on any kind of hot surface, with the exception of rollers and lagged surfaces. The pyrometer shown at C in Fig. 14 is similar to those described, but the thermo-couple and convection shield are hinged, so that the instrument may be used on hot surfaces difficult of access. For the measurement of relatively low temperatures, special instruments are available in which the sensitive element, which is placed in contact with the hot surface, consists of a nickel wire resistance bulb in a protecting copper chamber.

THE HEATLY-GRESHAM ENGINEERING COMPANY, LTD.

On this occasion the Heatly-Gresham Engineering Company, Ltd., of Letchworth, Hertfordshire, is laying stress in connection with its exhibit more on the production of pressings and drop forgings than on other products, and on the stand the firm has staged a representative exhibit of pressings. We understand that since the last Fair the company has installed a press which is said to be capable of drawing to a greater depth than any other press in this country. It will accommodate circular blanks of 79in. diameter and draw to a depth of 59in. It will, of course, handle rectangular blanks of 79in. in width, but of considerably greater length. The total pressure which can be applied is 1400 tons, and some very fine samples of deep-drawn articles produced by this press are on view.

A representative display of drop forgings is also shown, these being in steels of several different kinds. In some cases the pieces have undergone considerable heat treatment, for which purpose a special equipment has been laid down.

This firm is again displaying some of its "Rational" products, the stand, for instance, being supplied with current from a generating set embodying one of the "Rational" engines. Some "Rational" exhausters are also being shown, and among them is a new model. This machine is a single-cylinder vertical exhauster, capable of running at very high speeds. It is particularly suitable for being driven from the engine shaft or other transmission shaft of I.C. locomotives. A working model of a vacuum brake for railway rolling stock is displayed, the brake cylinder being of the latest all-steel type.

DARWINS, LTD.

Permanent magnets for practically every conceivable purpose are being exhibited by Darwins, Ltd., of Fitzwilliam Works, Sheffield. Cast magnets and magnets made from rolled bar are on view. There is an extensive collection of magnets for use in moving coil loud speakers, and samples of a special cobalt iron alloy which has a saturation value from 10 to 15 per cent. higher than that of pure iron. The preparation of this alloy on a commercial scale has only been made possible by the advent of the high- frequency induction furnace, and its

FIG. 15—MAGNETIC SEPARATOR—DARWIN

magnetic properties make it of great value in parts of electro-magnetic apparatus which call for extreme magnetic densities. High-speed hack-saw blades, made from 18 per cent. tungsten high-speed steel, cobalt "fast-work" blades, and Vanadia blades are shown, the latter being claimed to be practically unbreakable under normal conditions of use, and even the high-speed blades are said to be remarkably flexible. Razor blades and holders, heat-resisting alloys, stainless steel, and tool steels constitute other exhibits.

The magnetic separator shown in Fig. 15 is intended for picking up heavy objects moving at slow speed. The magnetic surface consists of a series of units composed of magnetic material shaped and arranged to provide parallel edges separated by gaps, and a magnetic potential is produced across each gap by connecting the two poles of a magnet composed of

four bars to the two end units of the magnetic surface. The flux of the magnet will thus return from one pole to the other through the surface units and across the intervening gaps. The surface units are made of mild steel. This magnetic separator, the makers claim, is the only separator in which the length and cross section of the permanent magnet may be properly regulated to the combined lengths of the gaps between the surface units and the areas of cross section, so that for a given field strength the minimum amount of magnetic steel may be used.

THE QUASI-ARC COMPANY, LTD.

Several standard types of welding sets, examples of welded work and specimens of Quasi-arc patented electrodes, are exhibited by the Quasi-Arc Company, Ltd., of 15, Grosvenor-gardens, S.W. 1. The

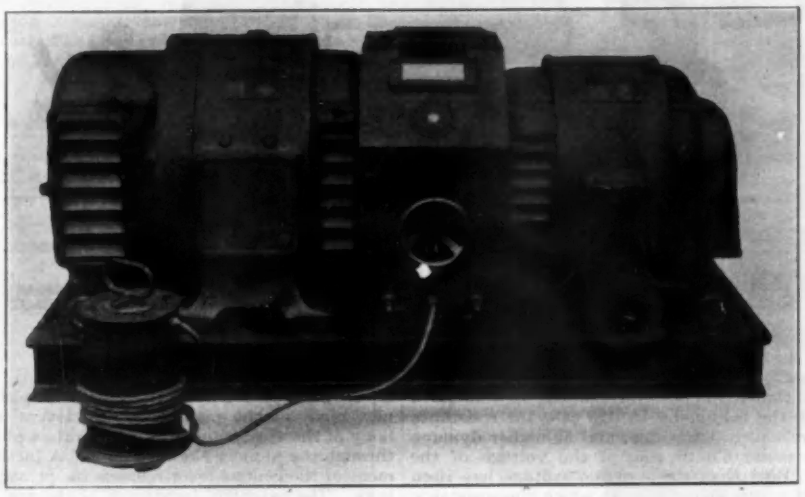


FIG. 16—MOTOR GENERATOR WELDING SET—QUASI-ARC

stand is provided with welding bays supplied with current from one of the company's three-operator alternating current transformer welding sets. A special railway type petrol engine-driven set, a portable transformer set—as shown in Fig. 17—and a single-operator motor generator set—Fig. 16—are also shown. Many types of welded joints, &c., as used in ships, bridge girders, &c., are on view, and several of the test pieces exhibited represent the basis on which Lloyd's Register of Shipping and the British Corporation for Survey and Registry of Shipping gave their approval for welded ship construction. Interesting photographs giving views of some of the largest and the most

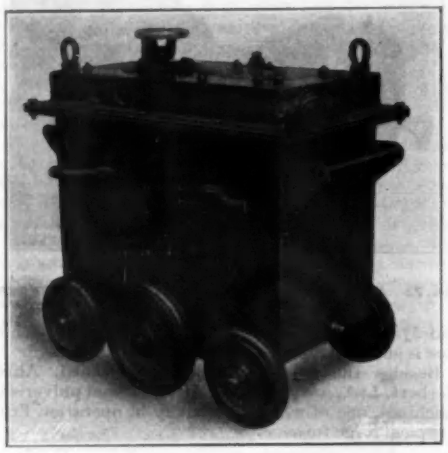


FIG. 17—PORTABLE TRANSFORMER WELDING SET—QUASI-ARC

important welded structures carried out in different parts of the world by means of Quasi-Arc electrodes and equipment are displayed.

GEORGE SALTER AND CO., LTD.

The display of George Salter and Co., Ltd., West Bromwich, just inside the entrance to the Fair, is familiar to most visitors, but this year there are some innovations. Over and above the great variety of springs with which this firm's name has been associated, ever since they made those for George Stephenson's "Rocket," there is a new form of flexible spiral roller bearing. These bearings will take both radial and axial loads and the rollers are made of chrome-vanadium steel coiled into spiral form in alternate directions. The spacing between the coils, together with the hollow core, makes the rollers resilient and provides a free passage for the lubricant.

There are some pressure gauges of the Bourdon and the Schaffer types, and a new form of crane-hook weigher, which gives a warning if it is attempted to lift too heavy a weight for the crane. Another crane safety device, which has been produced in view of the new Home Office regulations as to the loads which may be taken at various radii of the jib, gives a preliminary warning, in the shape of a red light, when the maximum safe load is being approached, and a final warning, by a bell or hooter, when that maximum load is actually reached. A sealed recorder is also incorporated to give evidence of the handling of the crane.

THE MICANITE AND INSULATORS COMPANY, LTD.

A comprehensive display of various electrical insulating materials used in the manufacture of electrical plant and apparatus is to be seen on the stand of the Micanite Insulators Company, Ltd., of Empire Works, Walthamstow, E. 17. There is a collection of 132-kV and 66-kV bushings suitable for both transformer and oil circuit breaker service. All these bushings are of the condenser type and, having regard to the ideas of different engineers, some have a filling of compound between the porcelain shell and the condenser bushing, whilst others are oil filled. For the latter class of construction it is claimed that it has been possible to combine all the advantages of the condenser type bushing with those of the ordinary oil-filled bushing without sacrificing the condenser type principle.

Another interesting exhibit is a large 132-kV wall bushing and four smoothing condensers suitable for a working pressure of 110,000 volts D.C. and having a capacity of 0·02 microfarads. The smoothing condensers have been used to form a part of the stand decoration scheme by utilising them as lamp standards, and they are surmounted by attractive lamp shades constructed from Glyptanite, a new synthetic bonded mica material which is now rapidly coming into use for heat-resisting articles, particularly electric irons. Micanite commutator segments and end rings, &c., and similar articles manufactured in Glyptanite are shown, also Paxolin varnish paper board, and many of the applications of varnish paper tubes are demonstrated.

W. FEARNEHOUGH, LTD.

ON the stand of W. Fearnehough, Ltd., Garden-street Works, Sheffield, there are many specimens of shear blades, and such like tools, which are characterised by the fact that they are faced with high-speed steel, with a backing of mild steel, so that they are not liable to be broken, and are also of moderate first cost.

There is also the rope trimming cutter illustrated by Fig. 19. It is intended for trimming the ragged fibres off rope as it is being manufactured, to improve its appearance. The device, it will be seen, is very much like a mowing machine, past which the rope passes as it leaves the laying-up machine. The rope is guided over the top of a ledger blade, which can be seen in the front of the machine, and the fibres are

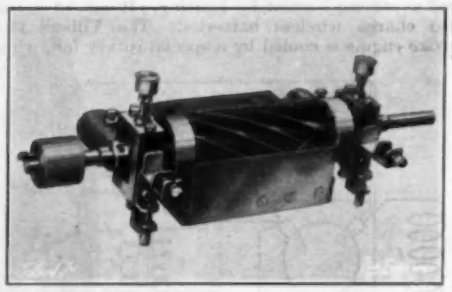


FIG. 19—ROPE-TRIMMING CUTTER—FEARNEHOUGH

cut off by a high-speed spindle, with helical cutters, as the rope rotates. Another useful product of this firm is a range of finished bars faced with high-speed steel in long lengths. The bars are hardened, tempered and finish ground, so that it is only necessary to cut off the required length to make such tools as wood-planing cutters and guillotine knives.

LUCAS FURNACES, LTD.

There are two gas-fired furnaces at work on the stand of Lucas Furnaces, Ltd., 53, Broad-street, Birmingham, one of which is illustrated by the line drawings, Fig. 18. As will be seen from these views, the products of combustion enter on both sides of the heating chamber and then pass forward through its full length, after which the waste gases pass over the front edge of the hearth, down a flue, and into the recuperator below. This arrangement creates a gas screen at the front of the furnace, which can be controlled by a damper, and enables work to be carried on with the door open without affecting the atmosphere and even heat of the furnace. The recuperator is made of metal tubes, on account of the greater thermal conductivity thus obtained, as compared with fire-brick, and runs the whole length of the furnace. The air for burning the gas is admitted transversely by ports which can be regulated, and it is preheated to practically the ignition temperature of carbon, so that a high-temperature flame is produced with a reducing atmosphere. The necessary draught is produced by a chimney. Heat losses by

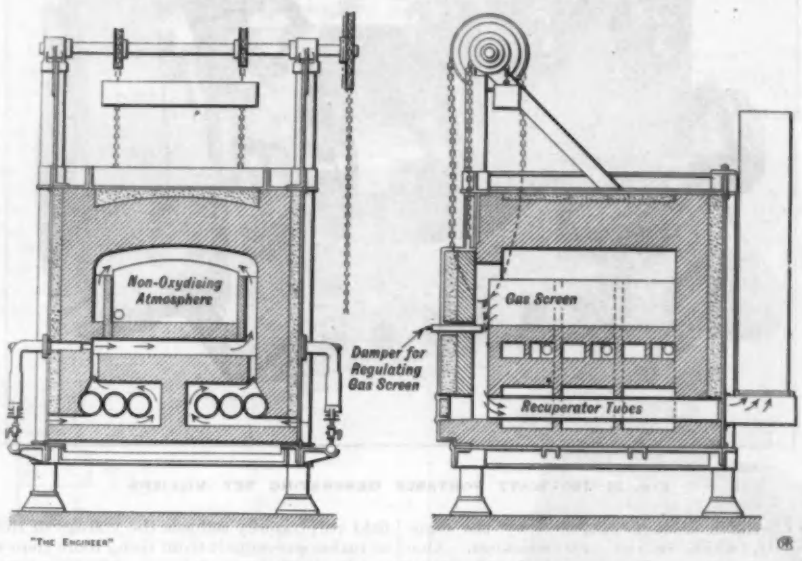


FIG. 18—GAS-FIRED FURNACE—LUCAS

radiation are reduced to a minimum by means of insulating bricks built into the thickness of the walls. An automatic temperature control instrument is provided by the Foster Instrument Company, Ltd., of Letchworth.

The other furnace exhibited is intended for hardening high-speed steel and has two chambers. The top chamber is worked on natural draught, and is used to preheat the work. The lower chamber is provided with forced draught for finishing the heat. This furnace also has a recuperator.

THE VILLIERS ENGINEERING COMPANY, LTD.

One of the most interesting exhibits on the stand of the Villiers Engineering Company, Ltd., of Marston-road, Wolverhampton, is the "Pygmylyte" portable

electric lighting plant, shown in Fig. 21. It is a 160-watt petrol set, and we understand that it was designed by and is now used by an English explorer. Its total weight is only 70 lb., and it fits into a box of quite small dimensions, which can be carried by one man. It can be set to work without any fixing or special foundations, and it operates with a mixture of petrol and oil. It will light twelve 12-watt lamps, as used on omnibuses, and can operate a 12-volt fan. A gallon of petrol is said to work the set for twelve hours. Although designed primarily as a portable set, it can obviously be utilised as a stationary set, with storage batteries which can be used for starting purposes as well as storing current for lighting. It can, of course, also charge wireless batteries. The Villiers two-stroke engine is cooled by a special rotary fan, which

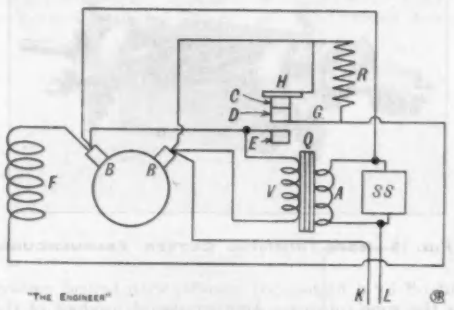


FIG. 20—WIRING OF REGULATOR FOR GENERATING SET—VILLIERS

directs a good blast of air on the cylinder. The normal speed is 1800 r.p.m. The 12-volt, 160-watt, shunt-wound dynamo is coupled to the engine shaft through a flexible coupling.

The principle of the regulator used for controlling the voltage will be understood from the diagram, Fig. 20, where F is the dynamo shunt winding and B B the brushes. R is the field resistance, which is periodically short-circuited by contact points C D. One end of the dynamo field winding F is connected to a brush directly, whilst the other end is connected to the other brush through contacts C D or the resistance R. Thus, as the contacts C and D open and close, resistance is switched into or out of the dynamo field circuit. One contact C is mounted on a rigid member H, and the other on a spring-controlled armature G, which is also controlled by the regulator core Q, which carries two windings. One winding V is a voltage coil connected directly across the brushes of the dynamo, whilst the other winding A is a current coil, shunted by a shunt S S. The winding A and the shunt S S carry the dynamo load current. The windings V and A assist one another. The leads K and L are connected to the lamp or battery load, and the dynamo and regulator work perfectly satisfactorily at varying speeds on a lamp load only.

When a battery is used, with the dynamo on open circuit, the winding V, resistance R and the tension of the control spring of the armature G, and the air gap of the regulator, are arranged to give the highest voltage to which the battery is to be charged. When a load is put on the dynamo, the coil A assists the coil V, and the voltage of the system is somewhat less than the maximum to which the battery can rise, but, as the battery becomes charged the voltage creeps up again to the maximum and the current sinks. By suitably proportioning the winding A and the shunt S S in relation to the other variables of the regulator, any combination of lamp load and battery load can be met, irrespective of whether the battery is of the lead or steel type, and the load can in this way be divided between the dynamo and battery in almost any proportions. In other words, the condition and state of the battery can be safeguarded under all conditions.

On the actual regulator employed on the generating set under consideration, in addition to the contacts C and D, there is another fixed contact E, which is joined to that dynamo brush which is connected directly to the field coil. In this case the resistance R has a relatively low value, and at higher dynamo speeds it is unable to control the voltage of the dynamo. But when the dynamo voltage has risen about half a volt above that at which the resistance R ceases to be able to maintain control, the contact D moves across and touches the contact E. Two new conditions then arise. In the first place, the field winding of the dynamo is short-circuited by the contacts D and E, and in the second place the resistance R is put in series with the positive and negative terminals of the dynamo. This short-circuiting of the field very rapidly reduces the voltage of the dynamo, or rather prevents it from rising more than about half a volt above the limit imposed by the contacts C and D, and a rush of current from brush to brush which might take place before the field had collapsed, is prevented by the insertion of the resistance R between the main terminals.

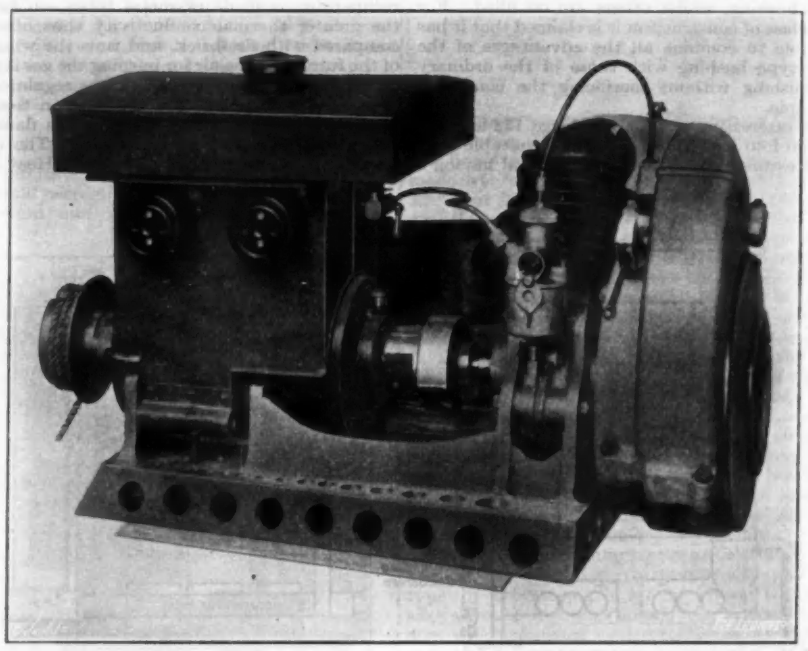


FIG. 21—160-WATT PORTABLE GENERATING SET—VILLIERS

ALFRED HERBERT, LTD.

Dieheads, dies, collapsing taps, Wickman gauges, and a wide range of engineers' small tools and workshop accessories are all to be seen among the exhibits shown by Alfred Herbert, Ltd., of Coventry. Among other things there are samples of gears cut in the firm's gear cutting department, and a display of tools for turret lathes. Particular interest is certain to be shown in the range of air-operated devices, such as chucks for capstan and combination turret lathes. The firm has now adapted the principle for use in a machine vice and a bench vice, and both these fittings are shown. We illustrate them in two engravings accompanying this article, Figs. 22 and 23. The second of these illustrations shows the air-operated bench vice, which, designed to work normally with air at a pressure of 80 lb. per square inch, exerts a grip of three-quarters of a ton. Ordinarily, use is made of the full air supply pressure, but for holding fragile work it is sometimes desirable to introduce a reducing valve. Such a fitting is shown in the engraving with the accompanying pressure gauge, by the indication of which the pressure can be regulated. In operation, the air control lever to be seen at the side of the vice is depressed, by which means a valve is opened and air enters a cylinder and drives back a piston. The movement of the piston actuates levers inside the body of the vice, which in turn operate a plunger and through the plunger close the jaws. A further movement of the control lever releases the pressure on the jaws. The extent of movement of the jaw provided by the air operation is about ⅜in. In order to adjust the vice to be suitable for any particular thickness of work the relative positions of the movable and fixed jaws may be altered by turning the knob at the front. If desired, the vice can be pedal operated. It has a jaw width of 4½in. and a maximum opening of 5½in. The air-operated machine vice—Fig. 22—is made in two sizes, the jaw widths and maximum openings being respectively 6in. and 8in. and 4½in. and 5½in. The principle of operation of the machine vice is similar to that of the bench vice.

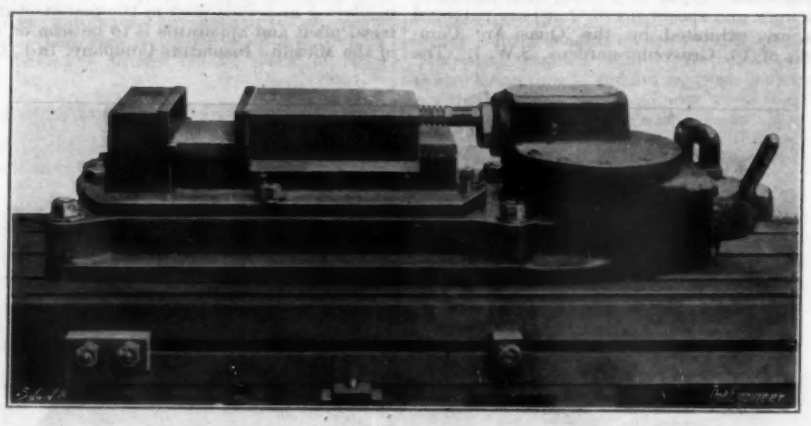


FIG. 22—AIR-OPERATED MACHINE VICE—ALFRED HERBERT

FIG. 23—AIR-OPERATED BENCH VICE—ALFRED HERBERT

Besides the exhibits already mentioned, Alfred Herbert, Ltd., are showing "Atritor" coal pulverising machines, one of which is actually in operation firing a typical forge furnace.

MELDRUMS LTD.

On the occasion of the last British Industries Fair, in a Supplement to our issue of February 13th, 1931, we described fully and illustrated a boiler fitted with a mechanical stoker of the sprinkler type constructed by Meldrums Ltd., of Timperley, near Manchester. At the Exhibition this year a stoker of the same kind is shown fitted to a Lancashire boiler front, with this difference, that instead of operating it by belt from overhead shafting, it is equipped with an independent motor drive. It will be remembered that in the "Meldrum" stoker the feeding mechanism consists of two portions—a measuring device and a beater or sprinkler. The first of these devices consists of a four-vaned casting, which is rotated at a wide range of speeds by a ratchet gear, while the other which sprinkles the fuel over the fire, runs continuously at 800 r.p.m. The latter is therefore driven almost at the same speed as the motor through V belting, running over stepped pulleys, while the shaft operating the ratchet mechanism of the measurer is driven at 25 r.p.m. through a gear-box incorporating two sets of worm-reduction gearing. The motor is mounted on a bracket directly above the gear-box. In other

respects no important alteration has been made to the stoker.

While the sprinkler stoker is fitted to one side of the demonstration boiler front, an automatic chip stoker for wood refuse is fitted to the other flue. The wood chips are passed from a cyclone collector into a hopper and automatically delivered into the boiler furnace. The firm is also exhibiting a flue section containing a "Meldrum" forced draught furnace and steel-cased destructor.

A new design of acid pump has some interesting features. The impeller of this centrifugal pump is of the double-suction type and, consequently, the gland is constantly under suction pressure, so that leakage is obviated The impeller head is mounted on a taper at the end of the steel shaft, which is protected where it passes through the stuffing-box by means of a sleeve constructed in acid-resisting metal or nickel-chrome material. The shaft is supported on a double row of ball bearings. The design is such that both the inlet and outlet branches are part of the main casing, so that the end cover can be removed without disturbing the pipework.

F. GILMAN (B.S.T.), LTD.

Most of the scaling tools and machines driven by flexible shafts manufactured by F. Gilman (B.S.T.),

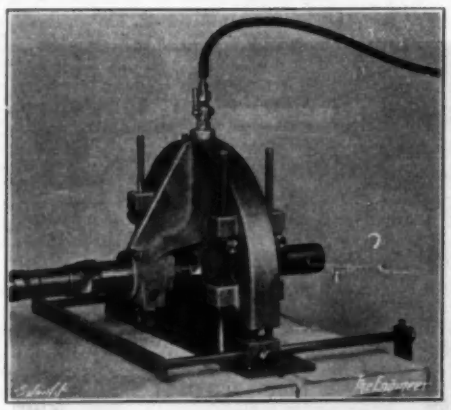


FIG. 24—STONE-SLITTING WHEEL—GILMAN

Ltd., of 221, High-street, Smethwick, are familiar to our readers, but there are two examples exhibited which are more novel. They comprise the stone-slitting wheel illustrated in Fig. 24, and the tube scaling tool shown in the drawing Fig. 25.

The stone-slitting wheel, it will be seen, is driven by a flexible shaft and is mounted in a housing which completely encloses the upper half. This housing is mounted, in turn, on skids that can be raised or lowered to determine the depth of the cut. There are also adjustable guides, which can be set to fix the distance of the cut from the edge of the stone. It is conceivable that, with the addition of templates, this machine might be used for roughing out statuary work.

The vibratory tool shown in Fig. 25 is intended for removing the scale from the outside of the fire tubes of boilers, but works within. It sets up a vibration within the tube which dislodges the outside scale, but is said to do no harm to the tube itself. The tool is operated by means of compressed air or steam. The air is admitted through the body at the inlet screwed portion into the chamber, where the sliding valve and valve anvil A and B work. As the valve moves it opens a port C. The air then passes through this port into the top chamber above the piston F and forces the piston into the position shown in the drawing. The valve B is thus lifted up and closes port C, opening a port on the opposite side. The air then passes to the chamber below the piston and so forces it in the opposite direction, *e.g.*, upwards. When the valves open and close the exhaust passes from the piston chamber down through the inlet holes into the space in the valve B. Sufficient space is left between the various ports to allow the exhaust to come through the end of the tube where the end of the vibratory tool is fixed. The head G of the tool being given a vibratory action in the manner described the scale which is dry is easily removed by the vibration set up, as no scale that is dry, the makers inform us, can withstand vibration.

The vibrator head G is designed to tap the inside of the tube with just sufficient force to remove the scale. The blow is approximately 3 to 4 foot-ounces at a high rate of speed, and as the steel tubes in the fire tubes are elastic, they vibrate, causing the scale which is not elastic to loosen and fall away. Scale in the case of the fire tubes is loosened from the outside of the tubes, cracks and falls out, and is easily raked out from the boiler. If any deposit is in the inside of the tubes a different head is used, and will easily remove the sooty carbon deposit. The pressure required is 80 lb. to 100 lb. per square inch, according to the nature of the scale.

There are also on this stand a number of applications of flexible drives, suitable for work with such a range as from dental laboratory tools to woodsawing and filing.

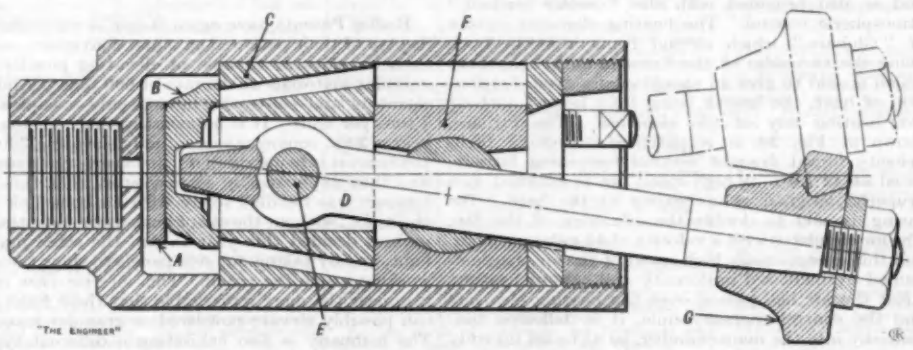


FIG. 25—TUBE-SCALING TOOL—GILMAN

TAYLOR AND CHALLEN, LTD.

The firm of Taylor and Challen, Ltd., of Derwent Works, Birmingham, is well known for the various types of presses that it makes. On its stand at Birmingham the most interesting exhibits are probably the toggle drawing press illustrated in Fig. 26, and two notching presses, one shown operating upon bicycle free wheel sprockets and the other upon discs. The steel frame toggle action drawing press is in operation forming a steel cup out of a blank 22in. in diameter by 18 gauge. The blank is drawn to a depth of 8½in. by 10½in. diameter, with a flange, in one operation. An interesting feature of the machine is a central support for the crank shaft,

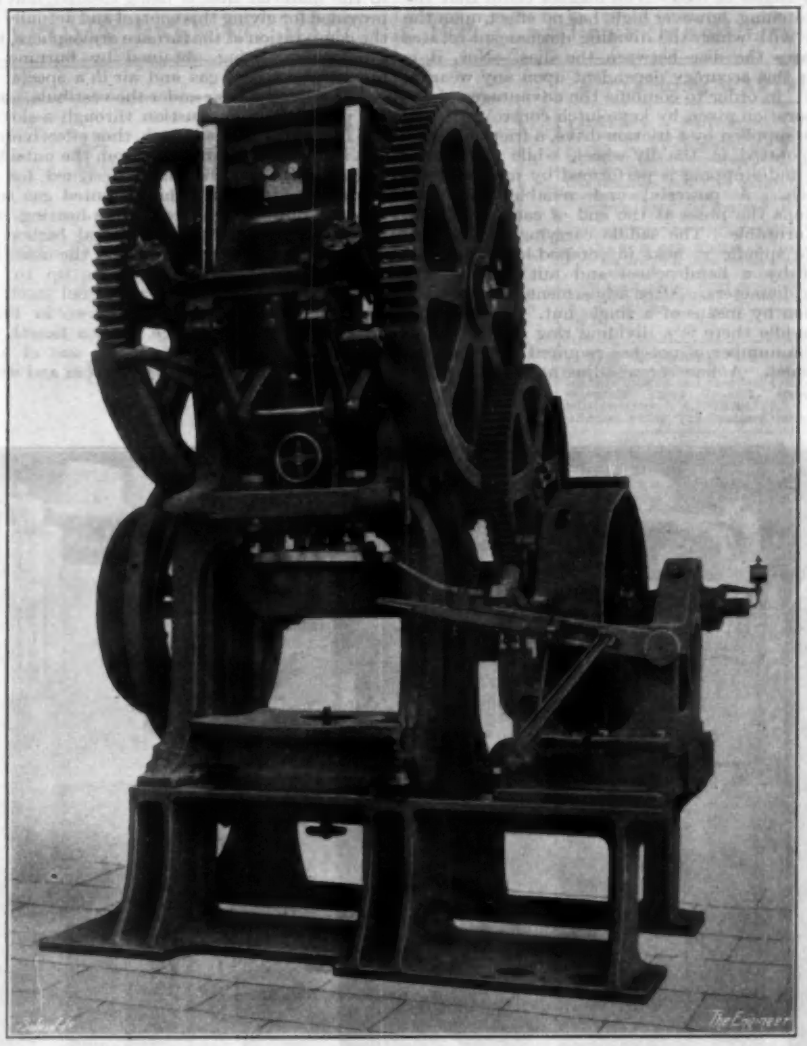


FIG. 26—TOGGLE DRAWING PRESS—TAYLOR AND CHALLEN

which enables the press to "bottom." This ability is demonstrated by the fact that the letters "T and C" are raised in the bottom of the cup. The machine weighs 24 tons, makes 5½ strokes a minute, and is driven by a 35 H.P. motor. The drive is through a friction clutch, and by the use of suitable hand levers the press can be stopped at any point of the stroke. This advantage will appeal to tool-setters.

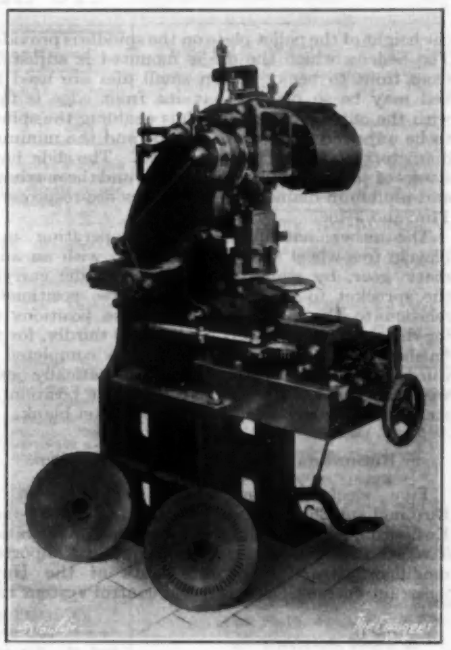


FIG. 27—HIGH-SPEED NOTCHING PRESS—T. AND C.

The press will also stop automatically at the top of the stroke. The cups produced by the drawing press are trimmed in a 15in. trimming and beading lathe, which can also be used for spinning when fitted with a suitable compound rest.

The high-speed notching press illustrated in Fig. 27 is capable of notching discs accurately at the rate of 700 notches per minute; this speed is reduced for large angles of feed. The makers claim that the rate of notching, however high, has no effect upon the accuracy with which the dividing mechanism rotates and locates the disc between the dies. Nor, it is stated, is this accuracy dependent upon any wearing surfaces. In order to combine the advantages of the rapid operation given by key-clutch control with the resilience supplied by a friction drive, a friction device is incorporated in the fly-wheel, while the actual starting and stopping is performed by means of the key-clutch. A powerful and reliable automatic brake stops the press at the end of each revolution of the turntable. The saddle carrying the vertical turntable spindle is held in scraped-in guides and adjusted by a hand wheel and nut for different notching diameters. After adjustment it is clamped in position by means of a single nut. Incorporated in the saddle there is a dividing ring by the use of which the number of notches required in a disc can be obtained. A fine screw adjustment to regulate the height of the pallet plate on the spindle is provided. The bed on which the die is mounted is adjustable from front to back. When small dies are used the bed may be so placed that its front edge is flush with the outside of the die, thus enabling the spindle to be adjusted close up to the die and the minimum diameters of plates to be notched. The slide has a stroke of ⅜in. with 1¼in. adjustment, and the maximum and minimum diameters of the discs are respectively 17in. and 3½in.

The other notching machine, operating upon bicycle free-wheel sprockets, is fitted with an automatic gear, by which the vertical spindle carrying the sprocket to be cut is set in three positions in relation to the cutting tools. These positions are for the rough cut, the second cut, and thirdly, for the finishing cut. When the sprocket has completed its third revolution, the machine automatically stops with the vertical spindle in the correct position for starting the rough cut on another sprocket blank.

BIRMINGHAM ELECTRIC FURNACES, LTD.

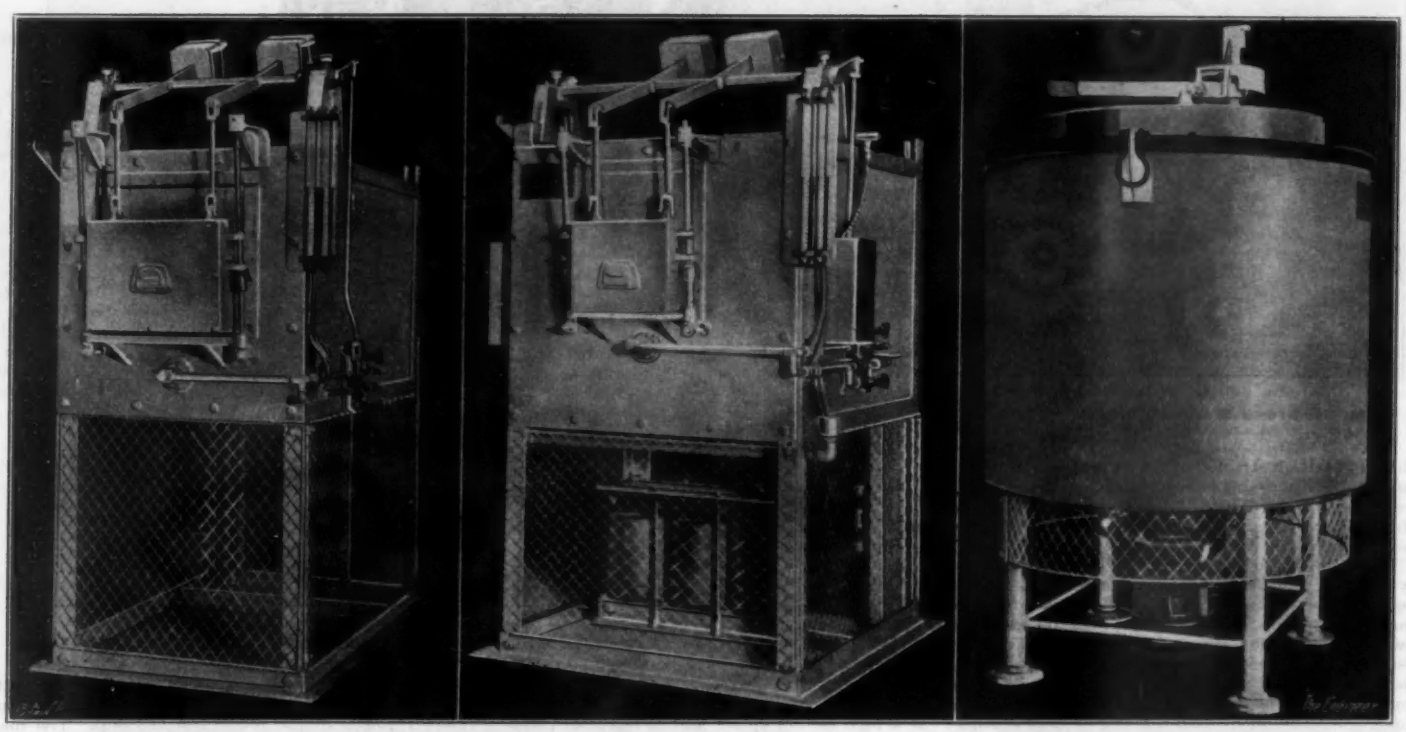
Five electric furnaces are being shown by Birmingham Electric Furnaces, Ltd., of Tyburn-road, Erdington, Birmingham, and they are all in operation. Two are new and two incorporate new and important modifications. The patent rights of the Hayes "certain curtain" atmospheric control system have been acquired by Birmingham Electric Furnaces, Ltd., and three of the furnaces exhibited are equipped with this system of control. Scaling and decarburisation have long proved to be a source of trouble in tool hardening and other work, and this new scheme is said to avoid these troubles. Experience has shown that, in order to secure the best results, it must be possible to vary the furnace atmosphere according to the material that is being treated, and means are provided for giving this control and actually indicating the composition of the furnace atmosphere, the correct atmosphere, being obtained by burning measured quantities of coal gas and air in a special mixing or combustion chamber under the vestibule, and emitting the products of combustion through a slot extending the full width of the hearth, thus effectively screening the interior of the furnace from the outside air.

Two "Birlec" furnaces, designed for tool-room work and fitted with this patented gas curtain, are shown, one designed for pre-heating high-speed tool steel and re-heating general carbon tool steel work up to 1000 deg. Cent., and the other capable of being operated at temperatures up to 1400 deg. Cent. for hardening high-speed tool steel. The first of these furnaces, which is shown in Fig. 28, is a 16 kW "Birlec" furnace, with a hearth 27in. long by 12in. wide, and constitutes one of an entirely new series of furnaces for tool-room and similar work requiring temperatures up to 1000 deg. Cent. The heating elements consist of a robust nickel-chromium strip, and are placed on the sides, on the roof and under the hearth of the furnace, and provision is made for the easy removal of the elements through the front.

The high-speed steel furnace—Fig. 29—is rated at 20 kW and has a hearth 12in. long by 8in. wide, and is also provided with the "certain curtain" atmospheric control. The heating elements consist of "Globars," which extend from front to back along the two sides of the furnace, an arrangement which is said to give an exceptionally even distribution of heat, the hearth being fully heated without over-heating any of the elements. The furnace, shown in Fig. 30, is a patented "Birlec" high-velocity forced draught vertical tempering furnace, rated at 12 kW. A high-speed fan is enclosed in a properly designed volute casing at the base. The casing is said to double the efficiency of the fan. The air circulates with a velocity of 40 miles per hour, and this exceptionally high speed of the air is accompanied by increased uniformity and rate of heating. After the air has passed over the heating elements and the control thermo-couple, it is deflected tangentially into the main chamber, so as to set up eddy currents round the charge. Besides the control thermo-couple at the top of the furnace there is one below the charge. The temperatures at these two couples are shown on a potentiometric recording instrument, and when they coincide give a definite indication that the charge is fully heated.

There is also a small furnace with a hearth 16in. long by 8in. wide, rated at 9 kW. It is one of a series designed for general use and can be employed for carburising, annealing, vitreous enamelling, &c., besides re-heating work, and also for "tempering" or secondary hardening of high-speed steel. The door is fitted with a heating element which ensures uniform temperature up to the front of the furnace. All these four furnaces are specially designed for the modern tool heat treatment room, although, as we have indicated, they have other applications. The remaining furnace, which is designed for mass production plant, is of special interest. It is a small conveyor furnace, equipped with "certain curtain" atmospheric control. Steel parts to be hardened are placed on the belt, and heated in the controlled atmosphere, and then automatically dropped into the quench. The furnace is sealed at the discharge end. The articulated nickel-chromium belt, which can take small parts without difficulty, is carried on nickel-chromium drums, and never leaves the furnace.

Other interesting exhibits consist of a full-scale, half-section of a large "Birlec" box-type furnace, designed to show the robust method of construction, the insulation, the patented heating element and the method of support. Owing to its size, it is impossible to show a complete furnace of this type, but photographs on the stand illustrate furnaces for annealing, general heat treatment of steel and non-ferrous metals, bright annealing, carburising, hardening, vitreous enamelling, forging, and other processes.



FIGS. 28 TO 30—16-kW ELECTRIC FURNACE, 20-kW HIGH-SPEED TOOL FURNACE AND 12-kW FORCED-DRAUGHT TEMPERING FURNACE—BIRMINGHAM ELECTRIC

REDLER PATENTS.

Redler Patents have again staged a comprehensive display of their patented *en masse* conveyors, ranging from an elevator capable of elevating powdered or granular materials at the rate of 600 tons per hour to elevators and conveyors having only a capacity of ¾ tons per hour. It is noteworthy that, whereas last year a 30in. conveyor was actually elevating 300 tons per hour, it is being run light this year. Such surprise was then expressed by some visitors that this large tonnage was handled solely with an open link work chain, *i.e.*, without the aid of buckets or slats, that the makers decided this year to run the same machine light, and by taking out side panels to show the chain working inside the trunk. This interior view makes it appear the more remarkable that these links alone can possibly elevate powdered or granular materials. The company is also exhibiting a different type of elevator with the conveying members attached to a steel cable. In this case there are three separate discharges simultaneously taking off from the up leg.